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Evolution of hydrological, sedimentary and biogeochemical cycles in the
the critical zone.

Title: Drought drives the net primary production reduction in the Amazon basin

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Abstract: Nature is usually assumed to respond gradually to changes in climate, however ecosystems can be affected by extreme events which may trigger shifts by changing disturbances-resilience dynamics. It is crucial to identify how ecosystems processes behave under these dynamics to well comprehend if there are stable states and better predict ecosystems services. The Amazon basin has experienced several droughts with different disturbance intensities. Recent studies identified drought in 2005, 2010 and 2015 as the most severe in the region, exceeding all previous events described and with progressive negative effects (lower precipitation, higher temperatures and solar radiation), especially in 2015 when 80% of the basin was affected. These findings makes questionable if NPP could change Amazon role from global carbon sink to source to atmosphere due extreme droughts. Here we show the net primary production (NPP) of the Amazon forest has decreased since 2000 when the MODIS sensor started to operate. The linear model predicts the Amazon forest lost 0,76 Pg C over 15 years with an average of 0,05 Pg C y⁻¹. The extreme droughts of 2005, 2010 and 2015 have contributed together to a loss of 1,90 Pg C, exceeding all positive C budgets of non-drought years. Our analysis indicates extreme droughts compromise the resilience of the Amazon forest resulting in a negative balance between forest greening and browning. Regional stable equilibrium between carbon production and consumption may decrease net production in discrete jumps, depending on drought intensity.

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